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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

RAPHAEL, COLLEEN M

ART UNIT

PAPER NUMBER

1724

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DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/541,704	<b>Applicant(s)</b> OHTAKE ET AL.	
	<b>Examiner</b> COLLEEN M. RAPHAEL	<b>Art Unit</b> 1724	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 July 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/8/2005; 12/5/2005</u> . | 6) <input type="checkbox"/> Other: ____.  |

## **DETAILED ACTION**

### ***Status of Claims***

1. Claims 1-9 are current in the application. Claims 1-9 are currently under examination.

### ***Priority***

2. Applicant is advised of possible benefits under 35 U.S.C. 119(a)-(d), wherein an application for patent filed in the United States may be entitled to the benefit of the filing date of a prior application filed in a foreign country.

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

4. The information disclosure statement (IDS) submitted on December 5, 2005 was filed after the mailing date of the application on July 8, 2005. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

### ***Drawings***

5. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the heater means, the primary side piping, the secondary side piping, the means for breaking the glass, and the means for applying the magnetic field must be shown and labeled or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

6. A substitute specification including the claims is required pursuant to 37 CFR 1.125(a) because the specification appears to be a literal translation into English from a foreign document and it is replete with grammatical and idiomatic errors.

A substitute specification must not contain new matter. The substitute specification must be submitted with markings showing all the changes relative to the immediate prior version of the specification of record. The text of any added subject matter must be shown by underlining the added text. The text of any deleted matter

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must be shown by strike-through except that double brackets placed before and after the deleted characters may be used to show deletion of five or fewer consecutive characters. The text of any deleted subject matter must be shown by being placed within double brackets if strike-through cannot be easily perceived. An accompanying clean version (without markings) and a statement that the substitute specification contains no new matter must also be supplied. Numbering the paragraphs of the specification of record is not considered a change that must be shown.

7. A substitute specification in proper idiomatic English and in compliance with 37 CFR 1.52(a) and (b) is required. The substitute specification filed must be accompanied by a statement that it contains no new matter.

### ***Claim Objections***

8. Claim 9 is objected to because of the following informalities: a missing period at the end of the claim. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 1-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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11. The claims are generally narrative and indefinite, failing to conform with current U.S. practice. They appear to be a literal translation into English from a foreign document and are replete with grammatical and idiomatic errors.

12. Claims 1-4 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: heating the solid rubidium and solid xenon such that gaseous xenon and rubidium in a mixture of gas and liquid phases (mixed-phase rubidium) are produced; irradiating the gaseous xenon and mixed-phase rubidium with a laser beam; and applying a magnetic field to the irradiated gaseous xenon and mixed-phase rubidium.

13. Claims 3-4 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relationship between the xenon gas supply device side, the primary side, and the xenon gas introducing side, and the secondary side. It is unclear what, if anything, differentiates the xenon gas supply device side from the xenon gas introducing side, or the primary side from the secondary side.

14. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: connecting the rubidium chamber and a glass cell with piping; exhausting the piping with a vacuum generator; breaking the

rubidium chamber; heating the rubidium, the piping, and the glass cell so that the rubidium enters the gaseous state; cooling the glass cell; precipitating the rubidium as a solid into the cooled glass cell; introducing xenon gas into the glass cell; closing a valve to isolate the glass cell.

15. Claims 6-8 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: a laser projecting a beam into the glass cell.

16. Claim 7-8 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: a means for controlling removal of the nuclear spin polarized xenon gas from the apparatus.

17. Claim 7 recites the limitation "said operation" in line 4. There is insufficient antecedent basis for this limitation in the claim.

18. Claim 8 is rejected as inheriting the insufficient antecedent basis of claim 7.

19. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: xenon gas supply piping.

20. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: the relationship

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between the primary side piping and the secondary side piping; the difference between the primary side piping and the secondary side piping; and the connection between the primary or secondary side piping and the glass cell.

21. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: connecting the rubidium chamber and a glass cell with piping; connecting the piping to a vacuum generator; connection to a means for breaking the rubidium chamber; connection to a means for heating the rubidium, the piping, and the glass cell so that the rubidium enters the gaseous state; and connection to a means for cooling the glass cell.

### ***Claim Rejections - 35 USC § 103***

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

23. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.



4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

24. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

25. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ryan et al (US 5,934,103) in view of Shino et al (US 5,039,500).

26. Regarding claim 1, Ryan teaches a method of producing nuclear spin polarized xenon gas characterized in that a glass cell having solid rubidium and filled with xenon in the pressure reducing state of being absent in oxygen (col. 3, lines 56-64) is heated to be gas xenon and gas-liquid mixed rubidium, to which a magnetic field is applied to irradiate a laser beam. (col. 4, lines 14-29). It is inherent that the glass cell is oxygen-free, as the rubidium (an alkali metal) is in elemental form. See MPEP § 2112(II).

27. Ryan does not explicitly teach that the xenon is solidified in the glass cell.

28. Shino et al teaches introducing xenon gas into a system and cooling it in order to solidify it. (col. 2, lines 3-10). Shino et al teaches that this allows separation of xenon from impurities such as krypton, and production of high-purity xenon. (col. 2, lines 35-43).

Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the method of Ryan by solidifying (condensing) the xenon onto the solid rubidium before heating the xenon and rubidium to produce a mixture of gaseous rubidium and xenon, because this would allow separation of xenon from impurities such as krypton, and production of high-purity xenon for further processing by the method of Ryan. (see Shino et al, col. 2, lines 35-43).

Regarding claim 2, Ryan teaches a method for the controlled flow of xenon gas, wherein the xenon gas may be introduced so as to maintain fixed pressure while taking out the nuclear spin polarized xenon gas produced by irradiating the laser beam. (col. 3, lines 65-67 and col. 4, lines 1-13)

Regarding claim 3, Ryan teaches a method for producing nuclear spin polarized xenon gas wherein in replacing a xenon gas supply device, the xenon gas supply device side is made to be a primary side through a first air operate valve, and the xenon gas introducing side of the glass cell is made to be a secondary side, (Fig. 3, col. 5, lines 42-65) and vacuuming of the primary side piping and pressurization-leaving by nitrogen gas are possible. (col. 6, lines 3-14) Note that mere repetition of a step until a threshold is met is obvious. See *Perfect Web Technologies v. InfoUSA*, 587 F.3d 1324, 1329 (Fed. Cir. 2009)

Regarding claim 4, Ryan teaches a method for producing nuclear spin polarized xenon gas wherein in replacing the glass cell, vacuuming of piping from the primary side piping, the secondary side pipe and piping to a valve on the polarized xenon gas take-out side communicated through a second air operate valve with the primary side pipe

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(col. 6, lines 15-34). Note that mere repetition of a step until a threshold is met is obvious. See *Perfect Web Technologies v. InfoUSA*, 587 F.3d 1324, 1329 (Fed. Cir. 2009)

Regarding claim 5, Ryan teaches a method of producing a glass cell having solid rubidium and xenon filled in vacuum characterized in that a chamber housing therein rubidium filled into a glass vessel and said glass cell are connected so that they are communicated by piping, said piping is exhausted by a vacuum generator, after which a glass vessel filled with rubidium is broken to heat metal rubidium, piping and glass cell, rubidium of gas is made present within the piping and glass cell, then said glass cell is cooled, metal rubidium is precipitated as a solid into the cooled portion, xenon gas is introduced into the glass cell and closed. (col. 6, lines 14-34)

Ryan does not teach that the glass cell is cooled to solidify xenon within the glass cell.

29. Shino et al teaches introducing xenon gas into a system and cooling it in order to solidify it. (col. 2, lines 3-10). Shino et al teaches that this allows separation of xenon from impurities such as krypton, and production of high-purity xenon. (col. 2, lines 35-43).

Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the method of Ryan by solidifying (condensing) the xenon onto the solid rubidium, because this would allow separation of xenon from impurities such as krypton, and production of high-purity xenon for further processing by the method of Ryan. (see Shino et al, col. 2, lines 35-43).

Regarding claim 6, Ryan teaches an apparatus for producing nuclear spin polarized xenon gas, comprising a means for heating a glass cell having solid rubidium and xenon filled in the pressure reducing state of being absent in oxygen (col. 3, lines 56-64) to be gas xenon and gas-liquid mixed rubidium, and means for applying a magnetic field to the glass cell to irradiate a laser beam. (col. 4, lines 14-29). It is inherent that the glass cell is oxygen-free, as the rubidium (an alkali metal) is in elemental form. See MPEP § 2112(II).

30. Ryan does not explicitly teach that the xenon is solidified in the glass cell.

31. Shino et al teaches introducing xenon gas into a system and cooling it in order to solidify it. (col. 2, lines 3-10). Shino et al teaches that this allows separation of xenon from impurities such as krypton, and production of high-purity xenon. (col. 2, lines 35-43).

Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the apparatus of Ryan by solidifying (condensing) the xenon onto the solid rubidium before heating the xenon and rubidium to produce a mixture of gaseous rubidium and xenon, because this would allow separation of xenon from impurities such as krypton, and production of high-purity xenon for further processing in the apparatus of Ryan. (see Shino et al, col. 2, lines 35-43).

Regarding claim 7, Ryan teaches an apparatus comprising a means for the controlled flow of xenon gas, wherein the xenon gas may be introduced so as to maintain fixed pressure while taking out the nuclear spin polarized xenon gas produced by irradiating the laser beam. (col. 3, lines 65-67 and col. 4, lines 1-13)

Regarding claim 8, Ryan teaches an apparatus wherein a xenon gas supply device side is made to be a primary side piping through a first air operate valve, piping extended up to a valve for introducing xenon gas into a glass cell is made to be a secondary side piping (Fig. 3, parts 44b, 66, 98, col. 5, lines 42-65), branched pipings connected to said primary side piping through a second air operate valve (Fig. 3, parts 82, 70, 78, col. 5, lines 42-65 and col. 6 lines 1-34), one of said branched pipings reaching a vacuum generator (Fig. 3, part 86, col. 6 lines 1-14) and the other reaching a valve on the xenon gas taking-out side of said glass cell (Fig. 3, part 90, col. 6 lines 1-14), and pressure regulating means for regulating pressure introduced into the glass cell is provided on the primary side piping. (Fig. 3, parts 44a, 44b, 60b, 62, col. 5, lines 42-65).

Regarding claim 9, Ryan teaches an apparatus of a glass cell having solid rubidium and xenon filled in vacuum comprising: piping connected so that a chamber housing rubidium filled into a glass vessel and the glass cell are connected (Fig. 3 parts 94, 96, 98, col. 6 lines 14-34), means for vacuuming the piping (Fig. 3, part 86, col. 6 lines 1-14), means for breaking glass having rubidium filled in (Fig. 3, part 94a, col. 6 lines 14-34), means for heating metal rubidium, piping and a glass cell (Fig. 3, part 104, col. 6 lines 14-34) and a means for cooling and trapping metal rubidium (Fig. 3, part 88, col. 6, lines 1-14).

32. Ryan does not explicitly teach that the means for precipitating metal rubidium is attached to the glass cell. However, it would be a mere rearrangement of parts to move the cold trap such that it was attached to the glass cell, because this would allow

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trapping of the rubidium before any gaseous rubidium passed into the gas flow loop.

See MPEP 2144.04 (VI)(C); *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975)

Shino et al teaches introducing xenon gas into a system and cooling it in order to solidify it. (col. 2, lines 3-10). Shino et al teaches that this allows separation of xenon from impurities such as krypton, and production of high-purity xenon. (col. 2, lines 35-43).

Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the apparatus of Ryan by solidifying (condensing) the xenon onto the solid rubidium before heating the xenon and rubidium to produce a mixture of gaseous rubidium and xenon, because this would allow separation of xenon from impurities such as krypton, and production of high-purity xenon for further processing in the apparatus of Ryan. (see Shino et al, col. 2, lines 35-43).

33. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ryan et al (US 5,934,103) in view of Raftery et al, "High-Field NMR of Adsorbed Xenon Polarized by Laser Pumping," Phys. Rev. Lett. 66 (5), pp. 584-587 (hereinafter Raftery et al).

Regarding claim 1, Ryan teaches a method of producing nuclear spin polarized xenon gas characterized in that a glass cell having solid rubidium and filled with xenon in the pressure reducing state of being absent in oxygen (col. 3, lines 56-64) is heated to be gas xenon and gas-liquid mixed rubidium, to which a magnetic field is applied to irradiate a laser beam. (col. 4, lines 14-29). It is inherent that the glass cell is oxygen-free, as the rubidium (an alkali metal) is in elemental form. See MPEP § 2112(II).

Ryan does not explicitly teach that the xenon is solidified in the glass cell.

Raftery et al teaches introducing xenon gas into a system and cooling it in order to adsorb it onto a surface. (right col., p. 585, para. 2, lines 1-18). Raftery et al teaches that this allows measurement of optically-pumped xenon with high enhancement (left col., p.585, para. 1, lines 11-12).

Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the method of Ryan by solidifying (condensing) the xenon onto the solid rubidium as taught by Raftery before heating the xenon and rubidium to produce a mixture of gaseous rubidium and xenon, because this would allow measurement of optically-pumped xenon with high enhancement. (see Raftery et al, left col., p.585, para. 1, lines 11-12).

Regarding claim 2, Ryan teaches a method for the controlled flow of xenon gas, wherein the xenon gas may be introduced so as to maintain fixed pressure while taking out the nuclear spin polarized xenon gas produced by irradiating the laser beam. (col. 3, lines 65-67 and col. 4, lines 1-13)

Regarding claim 3, Ryan teaches a method for producing nuclear spin polarized xenon gas wherein in replacing a xenon gas supply device, the xenon gas supply device side is made to be a primary side through a first air operate valve, and the xenon gas introducing side of the glass cell is made to be a secondary side, (Fig. 3, col. 5, lines 42-65) and vacuuming of the primary side piping and pressurization-leaving by nitrogen gas are possible. (col. 6, lines 3-14) Note that mere repetition of a step until a

threshold is met is obvious. See *Perfect Web Technologies v. InfoUSA*, 587 F.3d 1324, 1329 (Fed. Cir. 2009)

Regarding claim 4, Ryan teaches a method for producing nuclear spin polarized xenon gas wherein in replacing the glass cell, vacuuming of piping from the primary side piping, the secondary side pipe and piping to a valve on the polarized xenon gas take-out side communicated through a second air operate valve with the primary side pipe (col. 6, lines 15-34). Note that mere repetition of a step until a threshold is met is obvious. See *Perfect Web Technologies v. InfoUSA*, 587 F.3d 1324, 1329 (Fed. Cir. 2009)

Regarding claim 5, Ryan teaches a method of producing a glass cell having solid rubidium and xenon filled in vacuum characterized in that a chamber housing therein rubidium filled into a glass vessel and said glass cell are connected so that they are communicated by piping, said piping is exhausted by a vacuum generator, after which a glass vessel filled with rubidium is broken to heat metal rubidium, piping and glass cell, rubidium of gas is made present within the piping and glass cell, then said glass cell is cooled, metal rubidium is precipitated as a solid into the cooled portion, xenon gas is introduced into the glass cell and closed. (col. 6, lines 14-34)

Ryan does not teach that the glass cell is cooled to solidify xenon within the glass cell.

Raftery et al teaches introducing xenon gas into a system and cooling it in order to adsorb it onto a surface. (right col., p. 585, para. 2, lines 1-18). Raftery et al teaches



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that this allows measurement of optically-pumped xenon with high enhancement (left col., p.585, para. 1, lines 11-12).

Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the method of Ryan by solidifying (condensing) the xenon onto the solid rubidium, because this would allow measurement of optically-pumped xenon with high enhancement. (see Raftery et al, left col., p.585, para. 1, lines 11-12).

Regarding claim 6, Ryan teaches an apparatus for producing nuclear spin polarized xenon gas, comprising a means for heating a glass cell having solid rubidium and xenon filled in the pressure reducing state of being absent in oxygen (col. 3, lines 56-64) to be gas xenon and gas-liquid mixed rubidium, and means for applying a magnetic field to the glass cell to irradiate a laser beam. (col. 4, lines 14-29). It is inherent that the glass cell is oxygen-free, as the rubidium (an alkali metal) is in elemental form. See MPEP § 2112(II).

Ryan does not explicitly teach that the xenon is solidified in the glass cell.

Raftery et al teaches introducing xenon gas into a system and cooling it in order to adsorb it onto a surface. (right col., p. 585, para. 2, lines 1-18). Raftery et al teaches that this allows measurement of optically-pumped xenon with high enhancement (left col., p.585, para. 1, lines 11-12).

Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the apparatus of Ryan by solidifying (condensing) the xenon onto the solid rubidium before heating the xenon and rubidium to produce a

mixture of gaseous rubidium and xenon, because this would allow measurement of optically-pumped xenon with high enhancement . (see Raftery et al, left col., p.585, para. 1, lines 11-12).

Regarding claim 7, Ryan teaches an apparatus comprising a means for the controlled flow of xenon gas, wherein the xenon gas may be introduced so as to maintain fixed pressure while taking out the nuclear spin polarized xenon gas produced by irradiating the laser beam. (col. 3, lines 65-67 and col. 4, lines 1-13)

Regarding claim 8, Ryan teaches an apparatus wherein a xenon gas supply device side is made to be a primary side piping through a first air operate valve, piping extended up to a valve for introducing xenon gas into a glass cell is made to be a secondary side piping (Fig. 3, parts 44b, 66, 98, col. 5, lines 42-65), branched pipings connected to said primary side piping through a second air operate valve (Fig. 3, parts 82, 70, 78, col. 5, lines 42-65 and col. 6 lines 1-34), one of said branched pipings reaching a vacuum generator (Fig. 3, part 86, col. 6 lines 1-14) and the other reaching a valve on the xenon gas taking-out side of said glass cell (Fig. 3, part 90, col. 6 lines 1-14), and pressure regulating means for regulating pressure introduced into the glass cell is provided on the primary side piping. (Fig. 3, parts 44a, 44b, 60b, 62, col. 5, lines 42-65).

### ***Double Patenting***

34. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent

and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

35. Claims 1-8 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 7,541,051 B2 in view of Shino et al (US 5,039,500). Shino et al teaches introducing xenon gas into a system and cooling it in order to solidify it. (col. 2, lines 3-10). Shino et al teaches that

this allows separation of xenon from impurities such as krypton, and production of high-purity xenon. (col. 2, lines 35-43).

Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the method and apparatus of the '051 patent by solidifying (condensing) the xenon onto the solid rubidium before heating the xenon and rubidium to produce a mixture of gaseous rubidium and xenon, because this would allow separation of xenon from impurities such as krypton, and production of high-purity xenon for further processing by the method and apparatus of the '051 patent. (see Shino et al, col. 2, lines 35-43).

Claim 9 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 7,541,051 B2 in view of Ryan et al (US 5,934,103). Ryan et al teaches an apparatus comprising a glass cell having solid rubidium and xenon filled in vacuum, where diode laser arrays are used as the pumping laser. (col. 2, lines 4-14) Therefore, it would have been obvious to one with ordinary skill, in the art at the time of the invention, to modify the '051 patent by using the solid rubidium as a rubidium source as taught by Ryan, because this would enable the use of diode laser arrays as the pumping laser. (see Ryan et al, col. 2, lines 4-14)

### ***Conclusion***

36. Claims 1-9 are REJECTED.

37. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Pat. Pub. 2006/0173282 A1 (Method for the production of

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hyperpolarized  $^{129}\text{Xe}$ ); US 2,712,384 (Handling metallic sodium); US 5,642,625 (High volume hyperpolarizer for spin-polarized noble gas); US 6,125,654 A (Bulk production and usage of hyperpolarized  $^{129}\text{Xe}$ ); US 6,523,356 B2 (Metered hyperpolarized noble gas dispensing methods and associated devices); US 7,287,390 B2 (Optical pumping modules, polarized gas blending and dispensing systems, and automated polarized gas distribution systems and related devices and methods); Properties of Pure Metals, *Properties and Selection: Nonferrous Alloys and Special-Purpose Materials*, Vol. 2, *ASM Handbook*, ASM International, 1990, p 1099–1201; Jameson et al, "Nuclear Spin Relaxation by Intermolecular Magnetic Dipole Coupling in the Gas Phase,  $^{129}\text{Xe}$  in Oxygen," J. Chem. Phys. 89 (7), 1 October 1988, pp. 4074-4081; Frossati, "Polarization of  $^3\text{He}$ ,  $\text{D}_2$ , (and possibly  $^{129}\text{Xe}$ ) Using Cryogenic Techniques," Nucl. Instr. and Methods in Phys. Research A 402 (1998) pp. 479-483; Zook et al, "High Capacity Production of >65% Spin Polarized Xenon-129 for NMR Spectroscopy and Imaging," J. Mag. Res. 159 (2002) pp. 175-182; Bowers et al, "Cross polarization from laser-polarized solid xenon to  $^{13}\text{CO}_2$  by low-field thermal mixing," Chem. Phys. Lett. 205 (2,3), pp. 168-170; Song, Y-Q., "Spin Polarization–Induced Nuclear Overhauser Effect: An Application of Spin-Polarized Xenon and Helium," Concepts in Mag. Res., 12(1) pp. 6-20 (2000); Happer et al, "Polarization of the nuclear spins of noble-gas atoms by spin exchange with optically pumped alkali-metal atoms," Phys. Rev. A, 29 (6), June 1984, pp. 3092-3110.

38. Any inquiry concerning this communication or earlier communications from the examiner should be directed to COLLEEN M. RAPHAEL whose telephone number is

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(571)270-5991. The examiner can normally be reached on Monday-Friday, 9:30 a.m. to 6:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on (571)272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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